DARPA

Next Generation Internet Program

(http://www.ito.darpa.mil/Solicitations.html)

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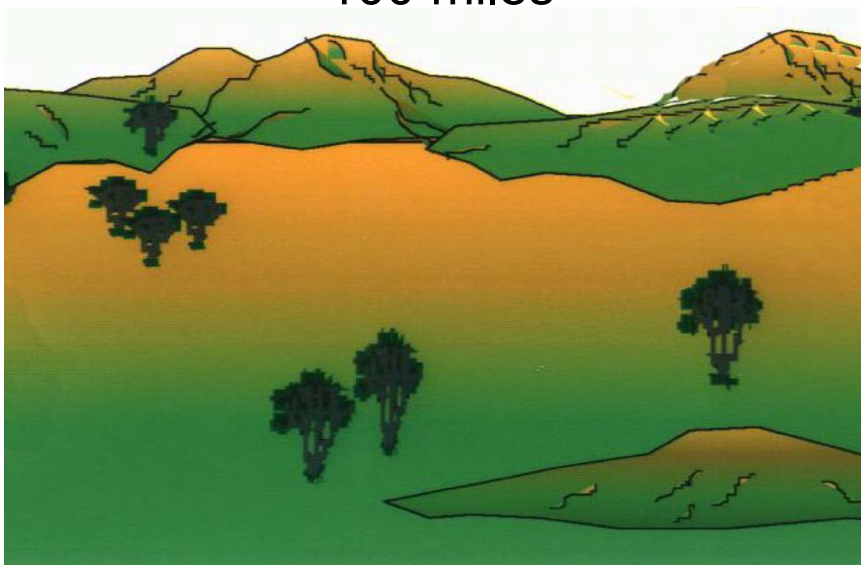
Information Technology Office

SuperNet Applications



(1 ft x 10 bits)

DOD Information Superiority Requires Terabit Battlefield Communications

2.8 Terabit

Communication Rate	Time for 2.8 Terabit
(T3 - 45 Mbps)	25 hours
(OC48 - 2.5 Gbps)	15 minutes
(Tbps)	2.8 seconds

Other Traffic Sources

Radar/SAR

Multi-spectral sensors
- Infrared
- μ-wave
- RF (Tbps)

DARPA BIT PROGRAM

200 Gb/s Capacity Laser Array Transmitter

Develop the All-Optical Wavelength Division Multiplexing (WDM) Technologies Necessary to Achieve Four New Physical Layer Networking Services

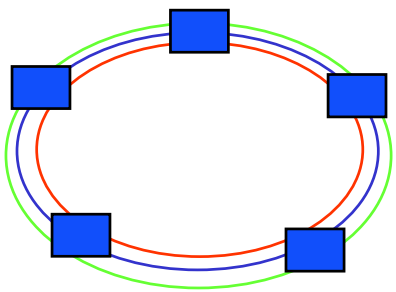
- gigabit per second bandwidth on demand
- rapid, nearly transparent reconfiguration of network routing at the physical layer
- multiplexing of continuous transmission rates from kbps to Gbps
- transmission of analog and digital signals in a single fiber

NGI Ultra High Speed Technologies

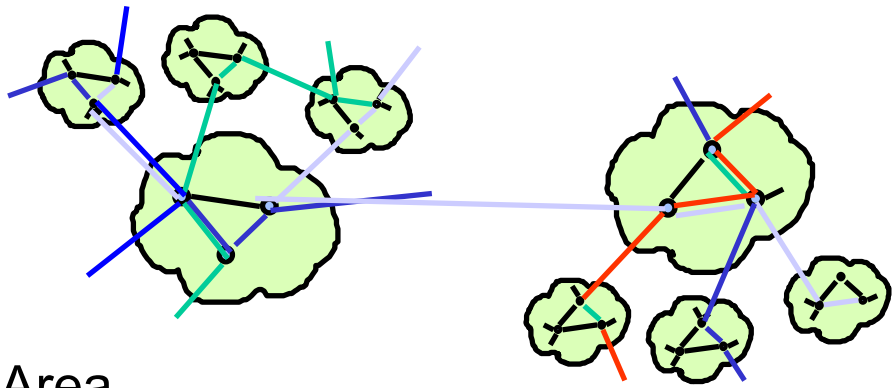
DARPA BIT Program

Point-to-Point Transport

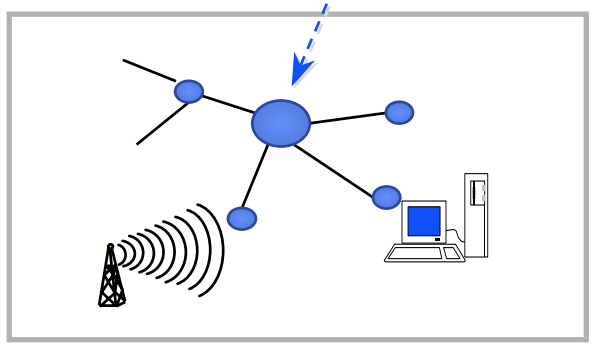
WDM Ring with Add/Drop



NGI Task 2.2

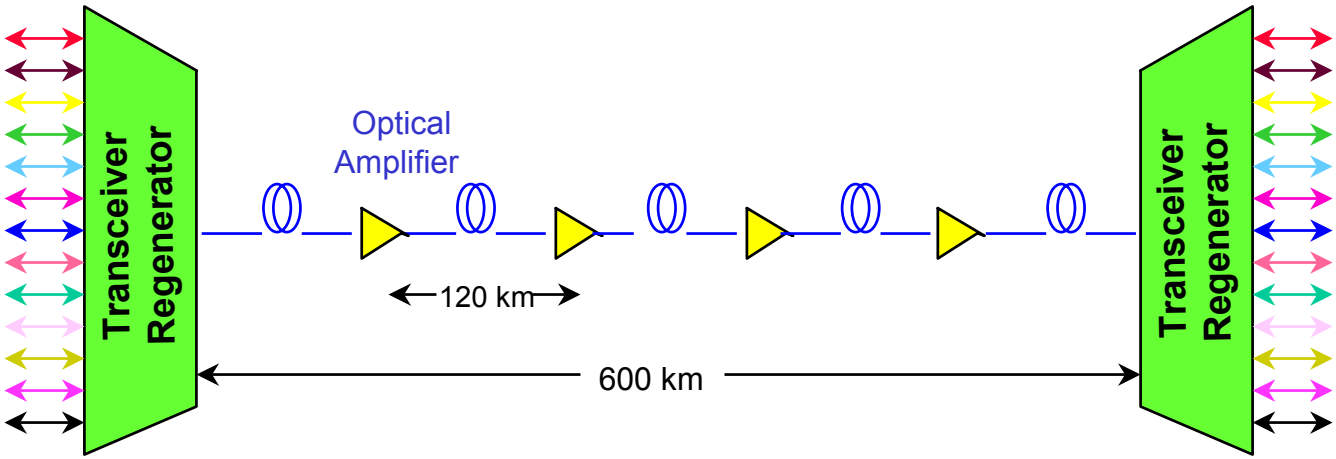


- Wide Area Broadband Networking
- Tb/s Multiplexing and Switching
- Broadband Local Trunking
- Field Trials

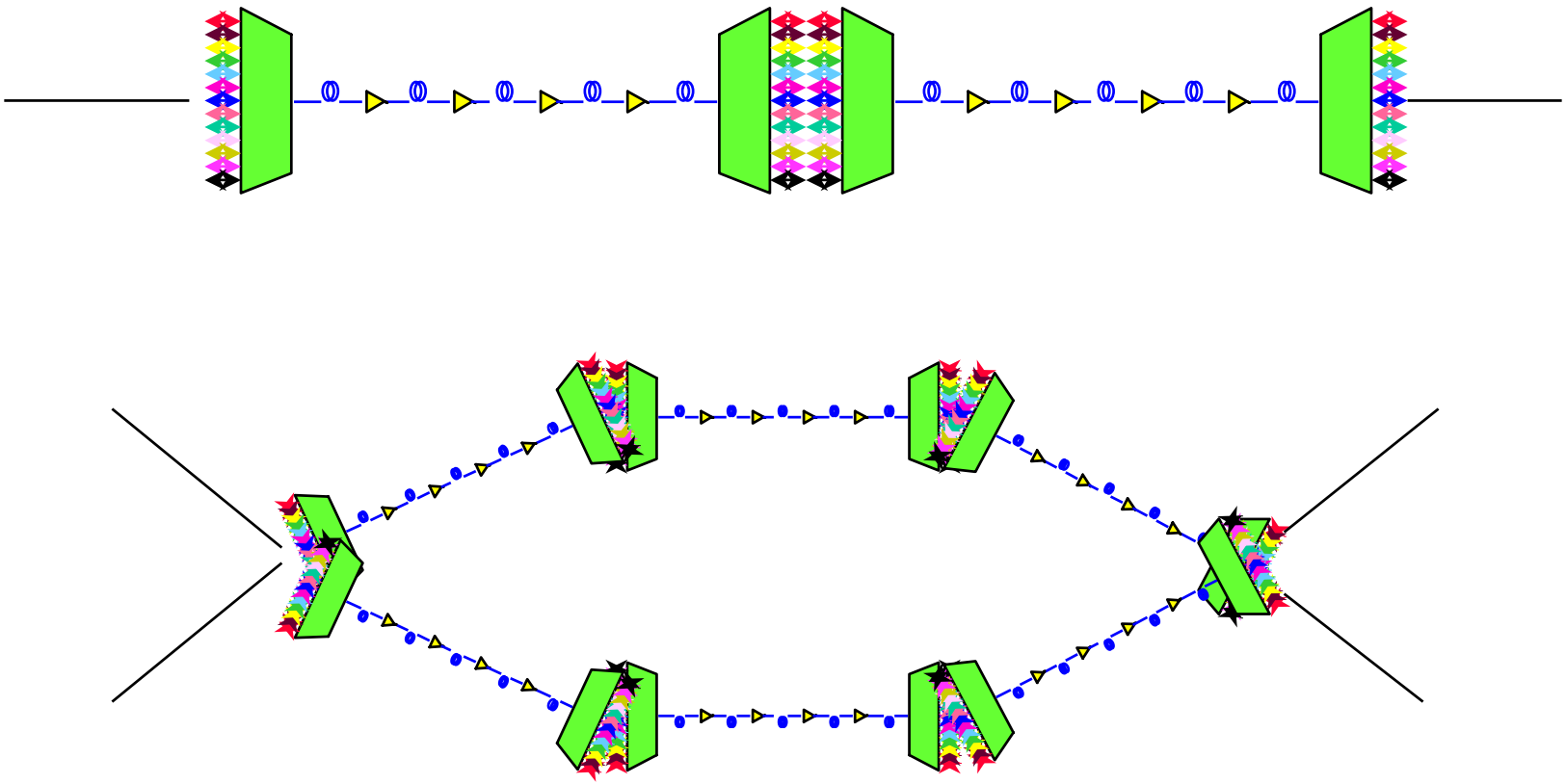


Wide Area Broadband Core (1)

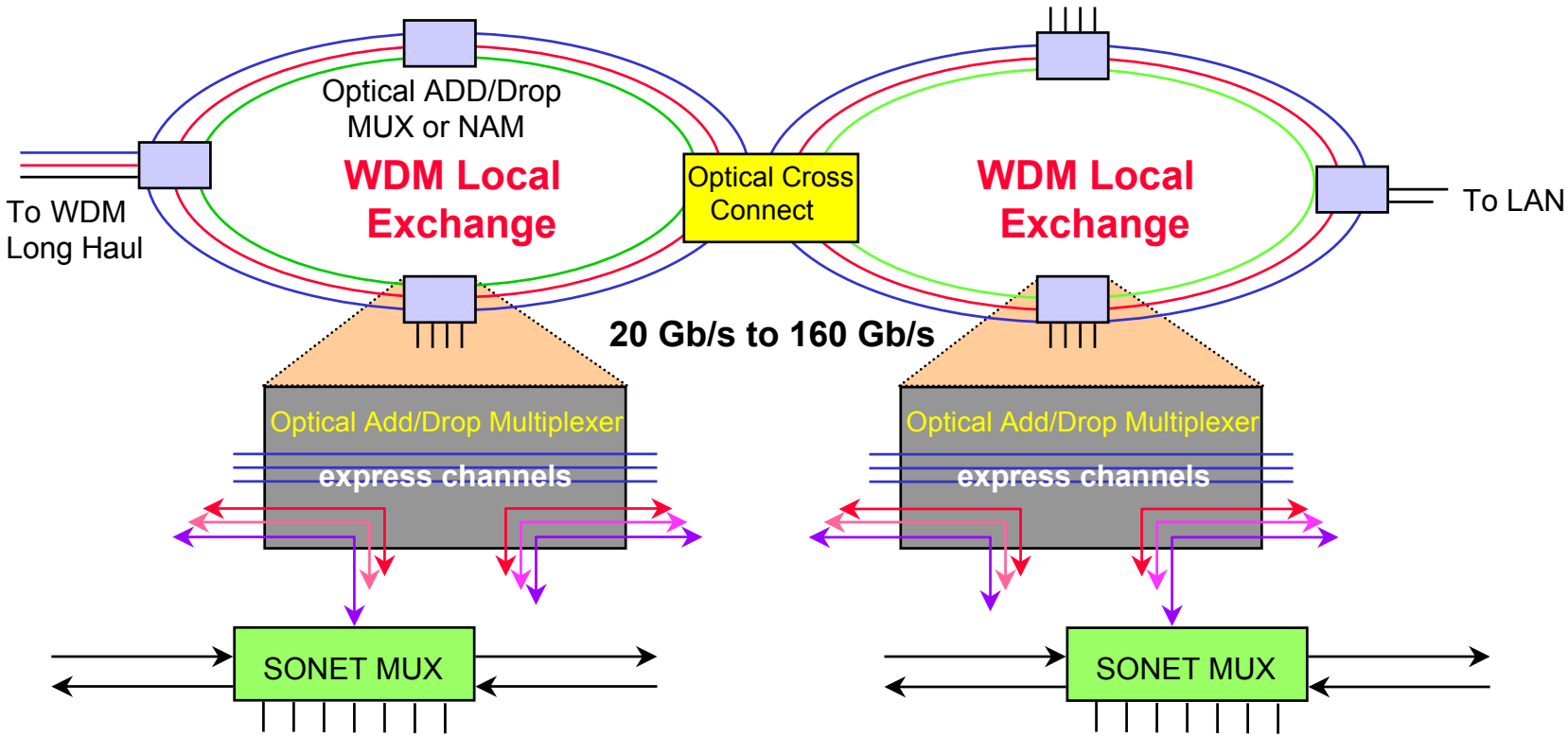
Point-to-Point WDM System



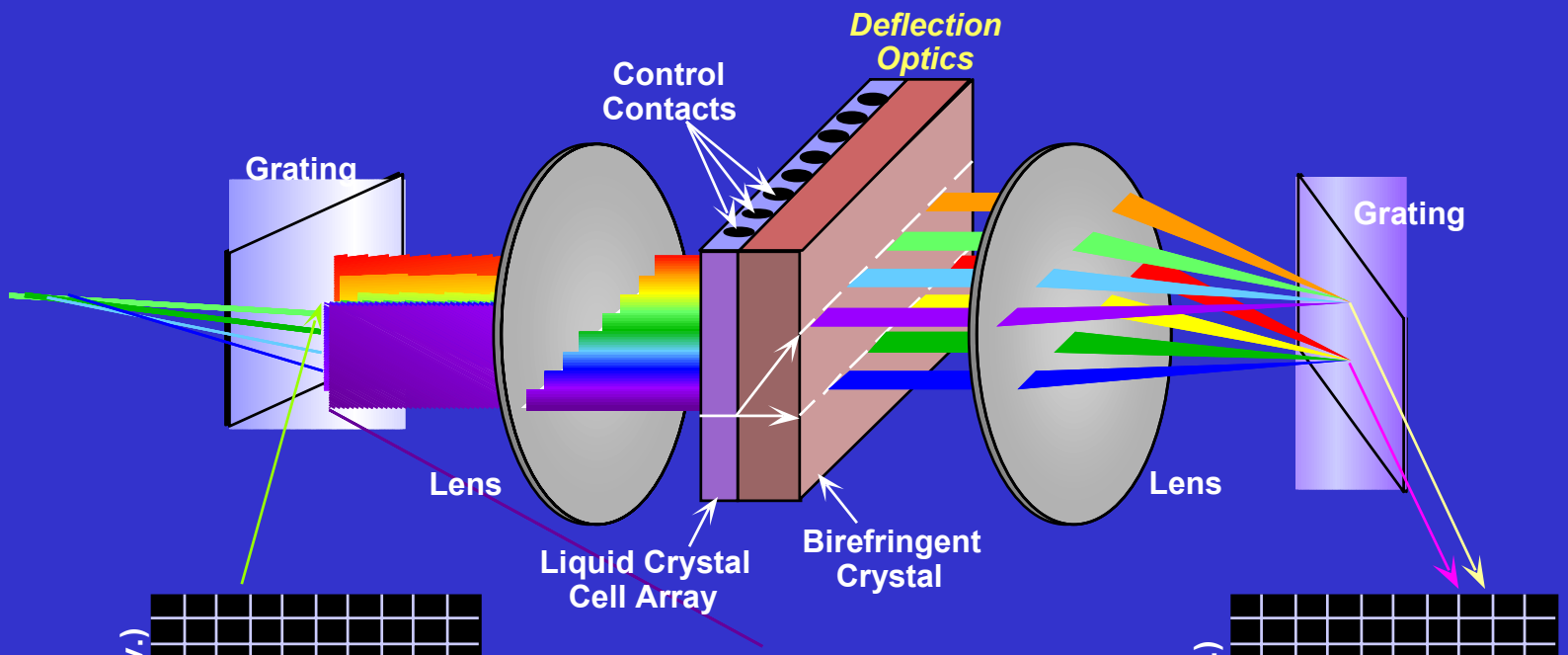
Wide Area Broadband Core (2)



Wide Area Broadband Core (4)



Optical Cross-Connect Liquid-Crystal Multiwavelength Switch



- Wide, Flat Passbands with High Spectral Efficiency
- Low Crosstalk (-35 dB)
- Simple, Low Voltage (~5V) Control

Wide Area Broadband Core (5)

Some Desirable Features:

- DWDM WAN/MAN Network (Bit Rate > 40 Gb/s)
- Architecture and Interface to Local Loop
- Reconfigurability & Multiple Degrees of Transparency
- Multiple Vendor Interoperability (Protection & Restoration)
- Very High Bit Rate Transmission Technology (e.g. PMD, Nonlinearity Suppression)
- Very High Bit Rate & Multiple Ports Network Element and Switches
- Network Management & Control
  - Inter-domain and Intra-domain
  - Integrated with Other Layers
- Consortium and Cost Share

Tb/s Multiplexing & Switching

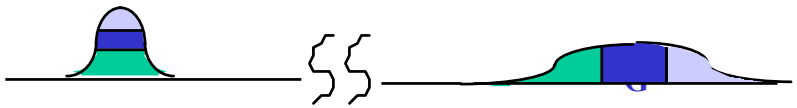
Packet Switching Technologies that are Scalable to Tb/s

- Hybrid Optical/Electronic Systems
- Ultra Fast All Optical TDM LAN Network Demonstration:
  - Transmitter, Receiver, Switch, Buffer, Logic Gates & Synchronizer
  - Architecture and Protocol (Guaranteed Bandwidth, and Bandwidth on Demand)
- Network Management

All Optical Soliton Technology

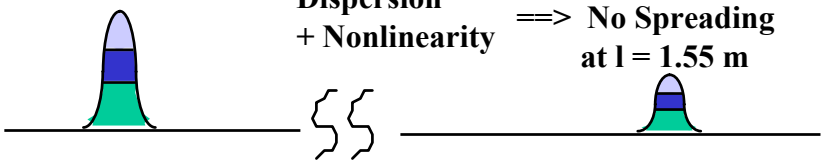
Linear

Dispersion ==> Pulse Spreading



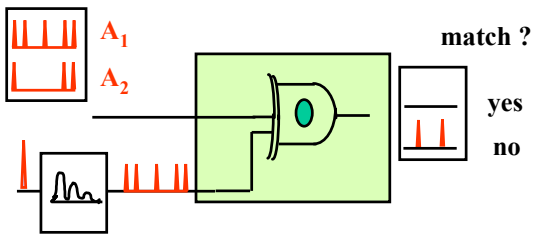
Soliton

Dispersion + Nonlinearity ==> No Spreading at l = 1.55 m

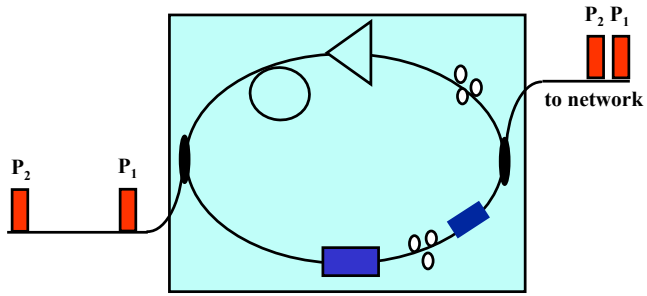


SYSTEMS	TODAY
Address Recognizers	100 Gb/s, 3 - Bit Code Very Low Duty Cycle
Buffers	150 Gb/s - Short Term Synchronous
Rate Converters	80 Gb/s - to - 1 Gb/s Optical - to - Electrical
Optical Logic Gates	40 Gb/s

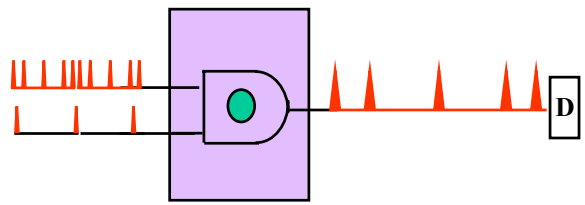
Address Recognizer



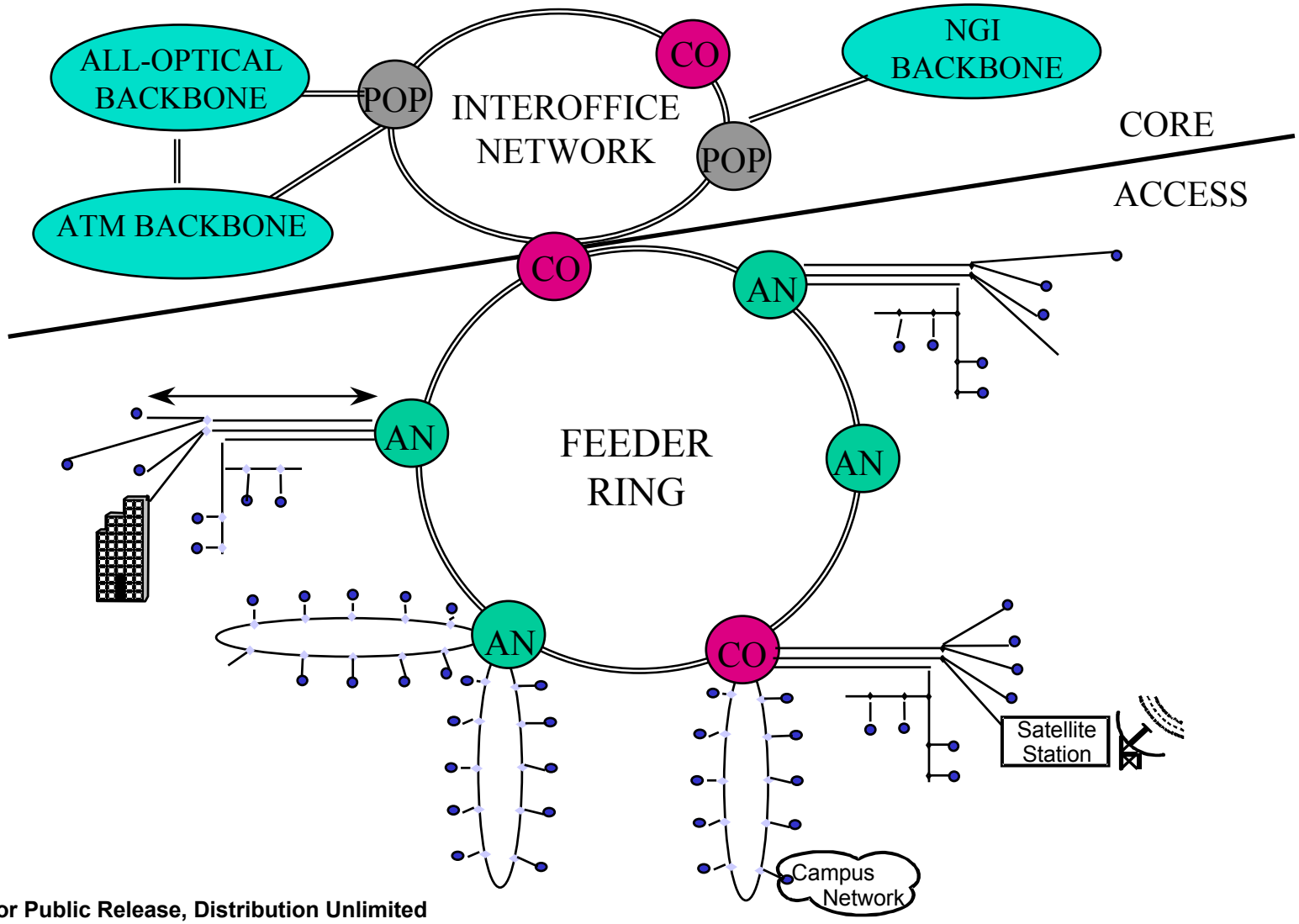
Packet Buffer



Rate Converter



An Access Network Architecture



Broadband Local Trunking or Broadband Access

Some Desirable Features:

- Near Transparent and Service Independent Connections to High End Users
- Access Network Architecture, Multiplexers and Switches
- Network Management (Bursty, Multicast, On Demand Traffic)
- Cost Effective